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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ROBBINS, JANET L	

ART UNIT	PAPER NUMBER
2857	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/800,421	KRAFT, RAYMOND H.
	Examiner	Art Unit
	Janet Robbins	2857

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 November 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,9,11-16 and 18-21* is/are rejected.

7)☒ Claim(s) *7,8,10,17 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The action is responsive to the Amendment filed on 18 November 2005. Claims 1 - 22 are pending. Claims 3 and 5 were amended.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Physical model-based non-rigid registration incorporating statistical shape information") and further in view of Ishida et al. (US Patent 6,067,373).

With respect to claim 1, Wang et al. teaches a method of point matching measured points to template points (pg 7, col 1, ln 3-7; Fig. 1; pg 8, col 2, ln 4-5; pg 9, col 1, ln 4-7; pg 10, col 1, ln 8-10; pg 12, col 1, ln 40-42); said method comprising:

acquiring measured data representing a set of measured point locations (Fig. 1: a, d [bottom]; pg 7, col 1, ln 3-7; Fig. 2: b, f; Fig. 3: f; Fig. 6; pg 16, col 1, ln 7-10; pg 15, col 1, ln 6-8);

comparing said set of measured point locations to template data (pg 7, col 1, ln 3-7; pg 9, col 2, ln 11-12; Fig. 1-4, 6, 9, 11, 12) representing a set of template point locations (pg 7, col 1, ln 3-7; Fig. 1: a, d [top]; Fig. 2: a, e; pg 12, col 1, ln 23-26);

determining force field vectors (pg 7, abstract, ln 5-7; Fig. 2: d, h; Fig. 3: d, h) operative to perturb said measured point locations into alignment with said template point locations (Fig. 1-4); and

responsive to said defining, matching measured point locations to template point locations (Fig 2: g; Fig. 3: g).

Wang et al. does not perturb the measured points (study image) to match the template points (atlas image), but rather moves the atlas image to align with the study image. Ishida et al. shifts the second image (measured) to align with the first image (template) (Ishida et al.: Fig. 4E-1: 4040; col 2, ln 33-37; col 3, ln 32-35; col 10, ln 50-67) as is described in the immediate application. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. to alter the measured image as done by Ishida et al. because Ishida et al. discloses methods of altering the first image alone, the second image alone, and both images at the same time. Thus Ishida discloses all combinations including that of altering, or perturbing, the measured data to correspond with the template data.

With respect to claim 11, Wang et al. in view of Ishida et al. discloses a computer readable medium encoded with data and instructions (Ishida et al.: col 19, ln 20-21) for point matching measured points to expected points (Wang et al.: pg 7, col 1, ln 3-7; Fig. 1; pg 8, col 2, ln 4-5; pg 9, col 1, ln 4-7; pg 10, col 1, ln 8-10; pg 12, col 1, ln 40-42); said data and said instructions causing an apparatus executing said instructions to:

acquire measured data representing a set of measured point locations (Wang et al.: Fig. 1: a, d [bottom]; pg 7, col 1, ln 3-7; Fig. 2: b, f; Fig. 3:f; Fig. 6; pg 16, col 1, ln 7-10; pg 15, col 1, ln 6-8);

compare said set of measured point locations (Wang et al.: pg 7, col 1, ln 3-7; pg 9, col 2, ln 11-12; Fig. 1-4, 6, 9, 11, 12) to reference data representing a set of expected point locations (Wang et al.: pg 7, col 1, ln 3-7; Fig. 1: a, d [top]; Fig. 2: a, e; pg 12, col 1, ln 23-26);

define force field vectors and moment arms (Wang et al.: pg 7, abstract, ln 5-7; Fig. 2: d, h; Fig. 3: d, h) operative to perturb said measured point locations into alignment with said expected point locations (Fig. 1-4); and

selectively repeat (Wang et al. (convergence): pg 14, section 5, paragraph 1):

Wang et al. does not perturb the measured points (study image) to match the template points (atlas image), but rather moves the atlas image to align with the study image. Ishida et al. shifts the second image (measured) to align with the first image (template) (Ishida et al.: Fig. 4E-1: 4040; col 2, ln 33-37; col 3, ln 32-35; col 10, ln 50-67) as is described in the immediate application.

Ishida et al. further teaches comparing, to said reference data, said measured point locations perturbed by said force field vectors and said moment arms (Ishida et al.: Fig. 4A,B, Fig. 4E-1,2) and redefining said force field vectors and said moment arms responsive to said comparing (Ishida et al.: Fig. 4B,D); until predetermined convergence criteria have been satisfied (Ishida et al.: col 10, ln 11-14). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of

Wang et al. to alter the measured image as done by Ishida et al. because Ishida et al. discloses methods of altering the first image alone, the second image alone, and both images at the same time. Thus Ishida discloses all combinations including that of altering, or perturbing, the measured data to correspond with the template data.

With respect to claims 4 and 14, Wang et al. teaches utilizing a one-to-one point matching algorithm (pg 8, col 2, ln 4-5; pg 9, col 1, ln 20-21).

With respect to claims 6 and 16, as noted above Wang et al. and Ishida et al. teach parent claims 1 and 11. Ishida et al. further teaches creating said force field vectors to act over a prescribed range (col 10, ln 56-64). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. to include the range of Ishida et al. because each range denotes a search area where the image is to be analyzed.

With respect to claim 9, Wang et al. further teaches selectively (In Wang et al. "selectively" could be interpreted to mean only calculating at sparse boundary points) repeating said comparing, said defining, and said matching (Wang et al. (convergence): pg 14, section 5, paragraph 1).

4. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Physical model-based non-rigid registration incorporating statistical shape information"), in view of Ishida et al. (US Patent 6,067,373), and further in view of Bove Jr. et al. (US Patent 5,946,425). As noted above Wang et al. and Ishida et al. disclose all the conditions of parent claims 1 and 11. They do not teach matching comprising utilizing a many-on-many point matching algorithm. Bove Jr. et al. teaches a method of

comparing images based on vector mapping small regions of pixels, or blocks of pixels (col 5, ln 18,33-36,43-57). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. and Ishida et al. to include the many-on-many point matching algorithm of Bove Jr. et al. because by not operating at a pixel-to-pixel level the overall image is not compromised by spurious missing data (Bove Jr. et al.; col 2, ln 24-27)

5. Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Physical model-based non-rigid registration incorporating statistical shape information"), in view of Ishida et al. (US Patent 6,067,373), in view of Bove Jr. et al. (US Patent 5,946,425), and further in view of Strom (US Patent 6,414,477). As noted above Wang et al., Ishida et al., and Bove Jr. et al. teach parent claims 2 and 12. Wang et al. also teaches determining the rotation between said measured point locations and template point locations (Wang et al.: pg 11, col 1, ln 2). These references do not explicitly teach determining offsets and position errors between said measured point locations and said template point locations. Strom teaches finding offset values and error values between the probe card (template) and scrub marks (measured) (col 6, ln 47-52). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al., Ishida et al., and Bove Jr. et al. to include the offsets and position errors of Strom because the offsets and position errors determine the force field vectors involved in the primary reference.

6. Claims 5, 15, 18, 19, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al. ("Physical model-based non-rigid registration

incorporating statistical shape information"), in view of Ishida et al. (US Patent 6,067,373), and further in view of Strom (US Patent 6,414,477).

With respect to claim 18, Wang et al. and Ishida et al. teach all the elements that claim 11 and claim 18 have in common. They do not teach the invention in the realm of a probe card analyzer system. Strom teaches a method of measuring probe locations in a probe card analyzer system (Strom: col 1, ln 6-9; col 7, ln 43-50). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. and Ishida et al. to bring the invention into the realm of probe card analyzers because it is necessary to minimize error values related to the data sets provided by probe machine combination tolerances in the same manner as described by Wang et al. for medical data.

With respect to claim 19, Wang et al., Ishida et al. and Strom teach all the elements of parent claim 18. Strom further teaches utilizing an imaging apparatus (col 5, ln 20-21). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. and Ishida et al. to bring the invention into the realm of probe card analyzers because it is necessary to minimize error values related to the data sets provided by probe machine combination tolerances and the imaging apparatus is vital to gaining the original image for evaluation.

With respect to claims 5, 15, and 20, as noted above Wang et al. and Ishida et al. teach parent claims 4, 14 and 18. Wang et al. also teaches determining the rotation between said measured point locations and template point locations (Wang et al.: pg 11, col 1, ln 2). These references do not explicitly teach determining offsets and

position errors between said measured point locations and said template point locations. Strom teaches finding offset values and error values between the probe card (template) and scrub marks (measured) (col 6, ln 47-52). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. and Ishida et al. to include the offsets and position errors of Strom because the offsets and position errors determine the force field vectors involved in the primary reference.

With respect to claim 21, as noted above Wang et al., Ishida et al., and Strom teach parent claim 18. Ishida et al. further teaches creating said force field vectors to act over a prescribed range (col 10, ln 56-64). It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wang et al. and Ishida et al. to bring the invention into the realm of probe card analyzers because it is necessary to minimize error values related to the data sets provided by probe machine combination tolerances.

Allowable Subject Matter

7. Claims 7, 8, 10, 17, and 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 18 November 2005 have been fully considered but they are not persuasive.

Applicant argues that the Application uses a method of *rigid* point matching of measured positions to template positions; however, this language is not found in any claim.

Applicant further argues that Wang et al. does not teach the set of measured point locations; however, Applicant's arguments are not well taken. Wang et al. teaches that there are "point sets" of boundaries which would fulfill the claim language of a set of measured point locations (Wang et al.: page 10, column 1, lines 6-10). The Examiner understands a set of measured points as claimed to be equivalent to the grid of pixels in Wang (Wang: page 9, section 2).

Applicant further argues that Wang et al. does not teach force field vectors to perturb measured point locations into alignment with said template point locations; however, Applicant's arguments are not well taken. As shown in the first Office Action, Wang et al. has force field vectors as shown in Figures 2: d, h; Fig. 3: d, h and the abstract explains that force field vectors are derived from a training set in order to match two sets of point data. Ishida et al. is further relied upon to teach shifting the second image (measured) to align with the first image (template) (Ishida et al.: Fig. 4E-1: 4040; col 2, ln 33-37; col 3, ln 32-35; col 10, ln 50-67).

Applicant further argues that Ishida does not deal with discrete points; however, Applicant's arguments are not well taken. Wang et al. is relied upon to teach defining

force field vectors to perturb points on one image into alignment with points on another image (Wang et al.: pg 7, abstract, ln 5-7; Fig. 2: d, h; Fig. 3: d, h). Ishida et al. shows that either the template or the measured points can be used to shift and transform coordinates of one image to match the other image (Ishida et al.: Fig. 4E-1: 40; col 2, ln 33-37; col 3, ln 32-35; col 10, ln 50-67). Ishida et al. also discusses values of pixels, which are discrete points within the images by definition (Ishida et al.: col 10, ln 50-65). Therefore both Wang et al. and Ishida et al. teach manipulating discrete points.

Applicant further argues that Wang does not teach repetition until convergence; however, Applicant's arguments are not well taken. As shown in the first Office Action, Ishida et al. teaches repeating the iterations until a set conversion point has been reached where a narrower histogram of pixel values is reached (Ishida et al.: col 10, ln 1-26).

Applicant further argues that Wang does not teach one-to-one point matching; however, Applicant's arguments are not well taken. As shown on page 9, col 1, ln 19 – col 2, ln 7, Wang et al. discusses the method proposed by Davatzikos and Prince which deforms boundaries in one image based on a one-to-one mapping they established. Wang et al. further discusses how his method *also* uses intensity information meaning that he uses both the intensity information and the one-to-one mapping.

Applicant further argues that Bove Jr. et al. does not teach many-on-many point matching; however, Applicant's arguments are not well taken. Bove Jr. et al. teaches mapping small regions of images corresponding to slices which are defined as a "series of picture elements, or "pixels," arranged in discrete locations on a planar grid" (Bove Jr.

et al.: col 3, ln 40-42). Each pixel has coordinates which define it as a point. Therefore Bove Jr. et al. is teaching matching these small regions which are made up of many points against other regions (Bove Jr. et al.: col 5, ln 33-57).

Applicant further argues that Strom does not teach acquiring measured data representing a set of probe point locations; however, Applicant's arguments are not well taken. Strom teaches measuring the locations of the touch down points of the probes in three different directions (Strom: col 7, ln 5-16). Therefore Strom has met the claim limitations that he has acquired measured data representing a set of probe point locations.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Janet Robbins whose telephone number is 571-272-8584. The examiner can normally be reached on weekdays from 8:00am - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc Hoff can be reached on 571-272-2216. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

MARC S. HOFF
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800

JLR
05 January 2006